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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314				
EXAMINER				
CHEN, KEATH T				
ART UNIT		PAPER NUMBER		
1792				
NOTIFICATION DATE		DELIVERY MODE		
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/549,285

Applicant(s)

YAMAZAKI ET AL.

Examiner

KEATH CHEN

Art Unit

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 August 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 6-8 and 31-45 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 6-8 and 31-45 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/S508)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. Applicants' amendment of the claims, filed on 08/15/2008, in response to the rejection of claims 1-8 in the first office action mailed on 02/15/2008, by amending claims 1 and 6, adding new claims 31-45 and cancelling claims 9-30 is acknowledged and will be addressed below.

Election/Restrictions

2. Applicants' cancellation of claims 9-30 is acknowledged.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-3, 6-8, and 31-32 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 1 recites the limitation of "a sidewall of the processing vessel having a rectangular section". There is lack of support in the specification.

4. Claim 39-43 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to

which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 39 recites "a center of the first flow path intersects with that of the second flow path substantially at a center of the substrate mounted on the supporting table" contradicts with the parent claim 33 which requires the flow path parallel.

Claims 40-43 has similar problem contradicts with the parent claim 33.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1-3, 6-8, and 31-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sano et al. (US 6407405, hereafter '405), in view of Boydston et al. (US 6375749, hereafter '749) and Anders (US 20020000779, hereafter '779).

6. '405 teaches some limitations of:

7. Claim 1: A substrate processing apparatus (Fig. 1) comprising: a processing vessel (chamber #1, col. 3, line 3) forming a processing space; a supporting table (substrate holder, #3, col. 3, line 27) for supporting a substrate (S) to be processed in the processing space; a nitrogen radical generation unit (#41, col. 3, lines 53-55), provided at at a first plane of the sidewall of the processing vessel at a first side (lower side of Fig. 1) of the supporting table, for forming nitrogen radicals by a high frequency plasma (RF, col. 3, line 55) and supplying the nitrogen radicals into the processing space, the nitrogen radicals flowing along a surface to be processed of the substrate from the first side to a second side (label "P", vacuum pump #2, col. 3, line 4), the

second side facing the first side with the substrate to be processed placed therebetween (S is between #41 and pump "P"); an oxygen radical generation unit (#31, col. 3, lines 48-51), for forming oxygen radicals by a high frequency (RF, col. 3, line 51) plasma and supplying the oxygen radicals into the processing space, the oxygen radicals flowing along the surface to be processed of the substrate from the first side to the second side; and a gas exhaust path (pump "P"), provided at an end portion at the second side (the upper side of Fig. 1), to exhaust the processing space, wherein the nitrogen radicals and the oxygen radicals flow towards the gas exhaust path from the nitrogen radical generation unit and the oxygen radical generation unit while forming a nitrogen radical flow path (a line connecting the center of #41 to the center of S) and an oxygen radical flow path (a line connecting the center of the #31 to the center of S) along the surface of the substrate (the substrate S will bend the gas path along the surface of the substrate) as to be processed, respectively.

8. Claim 33: A substrate processing apparatus (Fig. 1) comprising: a processing vessel (chamber #1, col. 3, line 3) forming a processing space; a supporting table (substrate holder, #3, col. 3, line 27) for supporting a substrate (S) to be processed in the processing space, the substrate having a surface to be processed (the surface facing the radical generation units); a first radical generation unit (#41, col. 3, lines 53-55), provided at a first sidewall portion of the processing vessel, for forming first radicals by a high frequency plasma (RF, col. 3, line 55) and supplying the first radicals into the processing space; a second radical generation unit (#31, col. 3, lines 48-51) for forming second radicals by a high frequency plasma (RF, col. 3, line 51) and supplying the

second radicals into the processing space; and a gas exhaust port (label "P", vacuum pump #2, col. 3, line 4), provided at a second sidewall portion of the processing vessel, to exhaust the processing space, the second sidewall portion being disposed opposite to the first sidewall portion with the supporting table placed therebetween (S is between #41 and pump "P").

9. '405 does not teach the other limitations of:

10. Claim 1: a sidewall of the processing vessel having a rectangular section; a rotatable supporting table; a rotation mechanism of the supporting table, (an oxygen radical generation unit) provided at the first plane of the sidewall at the first side.

11. Claim 33: a rotatable supporting table, (a second radical generation unit) provided at the first sidewall portion of the processing vessel, wherein the first and the second radical generation unit and the gas exhaust port are provided at the processing vessel, such that the first and the second radicals respectively flow from the first sidewall portion to the second sidewall portion along a first and a second flow path which are substantially parallel to the surface of the substrate mounted on the supporting table.

12. '749 is an analogous art in the field of semiconductor fabrication (field of the invention; '405 field of the invention), particularly in growing of an epitaxial layer (col. 2, lines 61-63, '405, col. 5, line 48). '749 teaches a rotation and translation mechanism (not shown, col. 5, lines 13-17) to substrate support shaft (Fig. 3 #82) and the inlet

(#106, col. 6, lines 65-67) to be parallel to the surface of the substrate (Fig. 3)

13. '779 is an analogous art in the field of semiconductor processing ([0004] '405 field of the invention), particularly in array of plasma (field of the invention) with a rectangular section. '779 provides a parallel array of plasma (Fig. 9) having rectangular section ([0093], similar to Applicants' rectangular plasma source in Fig. 5).

14. At the time the invention was made, it would have been obvious to a person having ordinary skill in the art to have consolidated various plasma sources in Fig. 1 of '405 into a rectangular parallel array of plasma, as taught by '779, such that all plasma sources are at the same/first plane; to have arranged the parallel array of plasma in parallel to the substrate surface; and to have added rotation mechanism, as taught by '749, to drive the substrate holder (#3), and to the apparatus in Fig. 1 of '405.

15. The motivation to add rotation mechanism for the supporting table is for evenly distributing reactants ('749, col. 5, lines 17-19) and the motivation to consolidate plasma sources is for a compact small diameter source design ('779, [0046]). The motivation to place the inlet in parallel with the substrate surface is suitability. The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. MPEP 2144.07.

16. '405 and '749, together, discloses the claimed invention except for (the oxygen radical generation unit) at the first plane of the sidewall at the first side. It would have been an obvious matter of design choice to re-arrange the generation units at the same plane of the sidewall, since it has been held that rearranging parts of an invention only involves routine skill in the art. *In re Japikse*, 86 USPQ 70.

17. In case Applicant argue that the rectangular section has to be a sidewall of the processing vessel, '405, '749, and '779, together, disclose the claimed invention except

for a rectangular sidewall of the processing vessel. It would have been an obvious matter of design choice to change the shape of the sidewall, since such a modification would have involved a mere change in the shape of a component. A change of shape is generally recognized as being within the ordinary level of skill in the art. *In re Dailey*, 357 F.2nd 669, 149 USPQ 1966.

18. '405 further teaches the limitations of:

19. Claim 2: The substrate processing apparatus of claim 1, wherein the nitrogen radical generation unit includes a first gas passageway (nitrogen flows within #41, col. 3, line 59) and a first high frequency plasma generation unit (not shown; column 3; lines 53-56) formed at a part of the first gas passageway to excite a nitrogen gas passing therethrough into a plasma (col. 3, line 53); and the oxygen radical generation unit includes a second gas passageway (oxygen flows within #31, col. 3, line 57) and a second high frequency plasma generation unit (not shown; column 3; lines 49-52) formed at a part of the second gas passageway to excite an oxygen gas passing therethrough into a plasma (col. 3, line 48), wherein the first and the second gas passageway are in communication with the processing space (as shown in Fig. 1).

20. Claim 6: The substrate processing apparatus of claim 1, wherein a center of the nitrogen radical flow path intersects with that of the oxygen radical flow path in the processing vessel (as shown in Fig. 1).

21. Claim 7: The substrate processing apparatus of claim 1, wherein there is provided a flow adjusting plate (shutter S4, col. 3, lines 24-25, is capable of interfering flow) interfering with the nitrogen radical flow path to change a direction thereof.

22. Claim 8: The substrate processing apparatus of claim 1, wherein there is provided a flow adjusting plate (shutter S3, col. 3, lines 19-20) interfering with the oxygen radical flow path to change a direction thereof.

23. Claim 34: The substrate processing apparatus of claim 33, wherein the first radical generation unit is a nitrogen radical generation unit (#41, col. 3, lines 53-55) and the second radical generation unit is a oxygen radical generation unit (#31, col. 3, lines 48-51).

24. Claim 39: The substrate processing apparatus of claim 33, wherein a center of the first flow path intersects with that of the second flow path substantially at a center of the substrate mounted on the supporting table (by the use of shutter S3 and S4).

25. Claim 40: The substrate processing apparatus of claim 33, wherein there is provided a flow adjusting plate (shutter S4, col. 3, lines 24-25, is capable of interfering flow) interfering with the first flow path to change a flow direction thereof, the first radicals being introduced into the processing space along the first flow path whose flow direction has been changed.

26. Claim 41: The substrate processing apparatus of claim 33, wherein there is provided a flow adjusting plate (shutter S4, col. 3, lines 24-25, is capable of interfering flow) interfering with the first flow path to supply the first radicals towards a center of the substrate mounted on the supporting table (when shutter is open).

27. Claim 42: The substrate processing apparatus of claim 33, wherein there is provided a flow adjusting plate (shutter S3, col. 3, lines 19-20) interfering with the second flow path to change a flow direction thereof, the second radicals being introduced into the processing space along the second flow path whose flow direction has been changed.

28. Claim 43: The substrate processing apparatus of claim 33, wherein there is provided a flow adjusting plate (shutter S3, col. 3, lines 19-20) interfering with the second flow path to supply the second radicals towards a center of the substrate mounted on the supporting table (when shutter is open).

29. '477 further teaches the limitations of:

30. Claim 3: The substrate processing apparatus of claim 1, wherein the nitrogen radical flow path and the oxygen radical flow path are substantially parallel to each other (with the parallel plasma array Fig. 9).

31. Claim 31: The substrate processing apparatus of claim 3, wherein the nitrogen radical generation unit and the oxygen radical generation unit are installed adjacent to each other and are substantially in plane symmetry with respect to an adjacent surface between the nitrogen radical generation unit and the oxygen radical generation unit (as shown in Fig. 9).

32. Claim 44: The substrate processing apparatus of claim 33, wherein the first radical generation unit and the second radical generation unit are installed to the processing vessel adjacent to each other in a substantially plane symmetry (as shown

in Fig. 9).

33. '779, in combination with '405 and '749, teaches the limitations of:

34. Claim 35: The substrate processing apparatus of claim 34, wherein the nitrogen radical generation unit (one of the four in Fig. 9) includes a first gas passageway (one of the cell #160) and a first high frequency plasma generation unit ('405, RF, col. 3, line 55) formed at a part of the first gas passageway to excite a nitrogen gas passing therethrough into a plasma; and the oxygen radical generation unit (another one of the four in Fig. 9) includes a second gas passageway (another one of the cell #160) and a second high frequency plasma generation unit (RF, col. 3, line 51) formed at a part of the second gas passageway to excite an oxygen gas passing therethrough into a plasma, wherein the first and the second gas passageway are in communication with the processing space.

35. Claim 36: The substrate processing apparatus of claim 33, wherein the first flow path and the second flow path are substantially parallel to each other (as shown in Fig. 9).

36. The above combination of '405, '749, and '779 also would have met the limitations of:

37. Claim 32: The substrate processing apparatus of claim 1, wherein the nitrogen radicals and the oxygen radicals ('779, from the parallel plasma array) are introduced

into the processing vessel substantially parallel to the surface of the substrate ('749, from the inlet direction).

38. Claim 45: The substrate processing apparatus of claim 33, wherein the first radicals and the second radicals ('779, from the parallel plasma array) are introduced into the processing vessel substantially parallel to the surface of the substrate ('749, from the inlet direction).

39. Furthermore, for

40. Claim 37: The substrate processing apparatus of claim 33, wherein the distance between a center of the first flow path and that of the substrate mounted on the supporting table is 40 mm or less.

Applicant's claim requirements amount to an intended use of the pending apparatus claims. The claimed "distance" is a function of the substrate's geometry and thickness and/or size of the substrate. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

41. Claim 38: The substrate processing apparatus of claim 33, wherein the distance between a center of the second flow path and that of the substrate mounted on the supporting table is 40 mm or less.

Applicant's claim requirements amount to an intended use of the pending apparatus claims. The claimed "distance" is a function of the substrate's geometry and thickness and/or size of the substrate. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

Response to Arguments

Applicant's arguments filed 08/15/2008 have been fully considered but they are not persuasive.

42. Applicants' arguments with respect to 103(a) rejection of claim 1 based on Sano '405 and Boydston '749 is based on '405 failed to teach "the nitrogen radical flowing along a surface to be processed of the substrate" by drawing a line in '405 Fig. 1, see page 8 to the top of page 11.

This argument is found not persuasive for two reasons.

Firstly, the examiner maintains the flowing of nitrogen radical along a surface of the substrate because gas/radical intermix/penetrate each other and some nitrogen radicals will reach the substrate surface flow along the surface of the substrate (or how else can the nitrogen radical function in Fig. 1). Applicants' arbitrary drawing of flowing direction is not consistent with the common knowledge of gas flow.

Secondly, in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). '749 teaches the gas/radical inlet along the direction of the substrate surface.

43. In regarding to 103(a) rejections of claims 4, 5, and 6, see the third to fifth paragraphs of page 11, Applicants' apparently is arguing for the new claims 37 and 38. Applicants argument is the instant applicant set the limit is not intended use.

The examiner maintains that the intended use of prior art apparatus, by the use of various size of substrate, will meet the claim limitations.

44. Applicants arguments to the new claims are not persuasive in light of the rejection discussed in the rejection above.

Conclusion

45. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEATH CHEN whose telephone number is (571)270-1870. The examiner can normally be reached on 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. C./
Examiner, Art Unit 1792
/Ram N Kacker/
Primary Examiner, Art Unit 1792